A DESIGN PROPOSAL FOR TENEMENT HOUSING TO REPLACE AT-RISK RESIDENTIAL AREA IN PABAHAY 2000 MUZON SOUTH CITY OF SAN JOSE DEL MONTE, BULACAN

A Descriptive-Developmental Research

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Major in Construction Engineering and Management

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RECOMMENDATION

This is to certify that this research, titled **" A DESIGN PROPOSAL FOR TENEMENT HOUSING TO REPLACE AT RISK RESIDENTIAL AREA IN PABAHAY 2000 MUZON SOUTH CITY OF SAN JOSE DEL MONTE, BULACAN"**, prepared and submitted by Afable, Charles Andrei B., Tarrayo, Krystenne Anne T., Oledan Paolo Laurence F., and Rojo Jr, Victor S. have been examined and PASSED the PRE-ORAL DEFENSE.

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We hereby certify that this thesis is our own work and that, to the best of our knowledge and belief, it contains no material previously written or published by another person or organization nor any material which has been accepted for the award of any other degree or diploma from a university or institution of higher learning, except where due acknowledgement is made thereof.

Furthermore, we declare that the intellectual content of this thesis is the product of our work. However, we have received assistance from others in the manner of organization, presentation, language, and style.

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CHAPTER 1

The Problem and its Background

This chapter presents the overview of the study including the introduction, background of the study, theoretical framework, statement of the problem, hypotheses, scope and limitations of the study, significance of the study, and definition of terms.

Introduction

Urban housing in the Philippines remains a critical and complex concern, particularly in highly urbanized regions such as Central Luzon Region. Large numbers of low-income families continue to reside in informal settlements that occupy environmentally hazardous and structurally unsafe areas, exposing residents to recurrent flooding, fires, building collapse, and heightened risks of communicable disease. Despite decades of state-sponsored resettlement and social housing initiatives, a substantial portion of the urban poor still experience inadequate, and overcrowded living conditions, revealing persistent gaps in both housing provision and long-term settlement planning.

Pabahay 2000 Muzon South in City of San Jose del Monte, Bulacan, exemplifies these challenges as a maturing resettlement community confronting the consequences of aging, largely temporary housing stock. Initially intended to transfer families away from danger-prone locations, the site successfully reduced immediate

physical exposure to certain hazards. The limited durability of the original structures, combined with population growth, constrained resources, and insufficient maintenance, has led to progressive physical deterioration and congestion. Many units are now characterized by substandard building conditions, inadequate facilities, and limited access to supportive services, effectively reproducing forms of vulnerability within areas that were meant to be safe and secure.

Philippine housing policies most notably the Urban Development and Housing Act (UDHA) of 1992 affirm the responsibility of the state to provide safe, affordable, and humane housing for underprivileged and homeless citizens. Urban Development and Housing Act have facilitated large-scale relocation, there remains a significant shortfall in the systematic upgrading of older resettlement sites into viable, sustainable, and livelihood-supportive communities. This thesis addresses that gap by proposing a comprehensive tenement housing redevelopment plan for Pabahay 2000 Muzon South, with the long-term objective of replacing deteriorating and informally modified structures with safe, legally compliant, and socially responsive tenement housing.

The study is guided by four principal objectives. It seeks to establish a detailed socio-demographic profile of the residents, including age distribution, household size, income levels, length of residency, and related characteristics, to understand the community's composition and needs. It evaluates tenement housing design options that enhance safety, stability, and residential comfort, emphasizing responsiveness to the most pressing concerns identified by occupants. It examines the extent to which proposed designs align with relevant Philippine laws, building codes, planning

standards, and affordability benchmarks for low-income families. It assesses the structural performance, durability, and cost implications of the proposed tenement typology to determine its technical feasibility and long-term viability as a redevelopment strategy.

The theoretical foundation of the research draws from three interrelated frameworks. Sustainable Development Theory underscores the necessity of housing solutions that are environmentally responsible, resource-efficient, and resilient to climate- and hazard-related risks. Maslow's Hierarchy of Needs positions adequate shelter as a fundamental prerequisite for fulfilling higher-order social, psychological, and economic aspirations, thus framing housing as central to human development rather than merely a physical structure. New Urbanism contributes principles that advocate for compact, walkable, and socially cohesive neighborhoods, emphasizing mixed-use environments, accessible public spaces, and community-oriented design. These perspectives support a housing model that is structurally sound, socially inclusive, and environmentally sustainable.

Methodologically, the study adopts a mixed-method approach that integrates social data collection with technical engineering analysis. Household surveys and related instruments are used to gather information on demographic characteristics, housing conditions, and resident preferences, grounding the design proposals in actual community realities. In parallel, structural analysis software using STAAD is employed to test the proposed tenement designs in terms of load-bearing capacity, stability, and compliance with structural standards, while also considering material

choices and construction techniques that support cost-effectiveness. The analysis is organized around three core dimensions, (1) anticipated community benefits, including improvements in safety, health, and quality of life, (2) conformity with national and local planning, housing, and building regulations, and (3) structural integrity, durability, and overall project cost.

The study acknowledges several limitations that may influence both the process and the generalizability of its findings. Access to all residents may be constrained by time, logistics, or varying willingness to participate, potentially affecting the completeness of the socio-demographic data set. The implementation of any redevelopment scheme is also contingent on the cooperation of multiple government agencies, local government units, and other stakeholders, whose priorities and resource capacities may differ. The proposed model is intended to be replicable, each resettlement site has distinct physical, social, and institutional conditions, which may necessitate adaptation of the design and phasing strategies.

Despite these constraints, the researchers seek to respond to one of the country's most urgent social imperative, the provision of safe, decent, and affordable housing for low-income urban communities. By formulating a tenement redevelopment plan for Pabahay 2000 Muzon South that is grounded in empirical community data, structured by established theoretical frameworks, and tested through rigorous technical analysis, the study aims to generate a practicable reference model for policymakers, planners, and housing agencies. It aspires to contribute to the creation of living environments in which residents particularly families with children

can inhabit secure, stable, and dignified homes that support their health, education, livelihoods, and long-term well-being.

Background of the Study

Rapid urbanization shapes the global housing landscape. According to the United Nations Human Settlements Programme (UN-Habitat), more than 1.1 billion people live in slums or informal settlements worldwide as of 2024. Urban migration, inadequate affordable housing, and insufficient infrastructure drive this trend. In the Philippines, urbanization rose from 45.3 % in 2010 to 51.2 % in 2015 Correspondingly, the country faces a housing backlog of approximately 6.5 million units and an estimated 3.7 million informal settler families (ISFs).

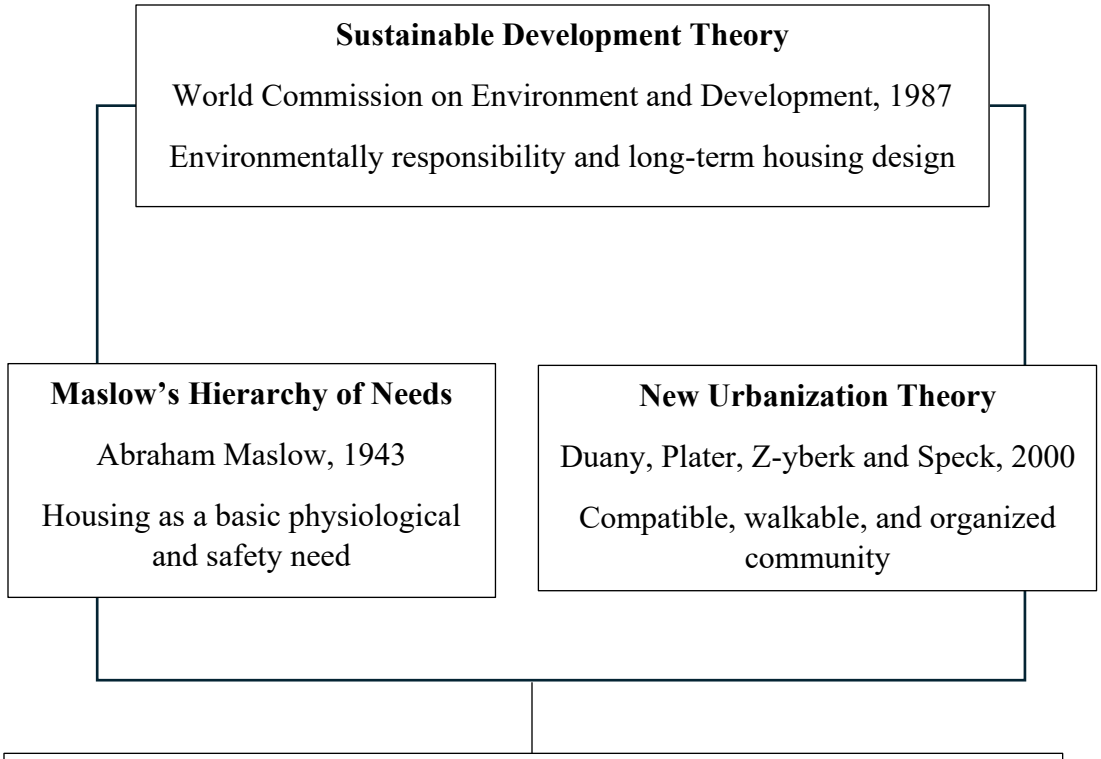
Informal settlements often emerge in at-risk zones: flood plains, steep slopes, and underserviced land parcels. These settlements lack formal tenure, basic utilities, proper structural safety, and integration with urban planning systems. Within the Philippines, the Metro Manila region exemplifies this challenge: between 20 % and 35 % of its population lives in informal settlements, exposed to disaster and displacement risks.

At the national and local levels, government frameworks recognize the urgency of upgrading informal settlements and providing safe, affordable housing. The National Urban Development and Housing Framework (NUDHF 2017–2022) highlights poor housing conditions and the spatial exclusion of informal settlements as constraints to resilient urban growth. Yet major gaps persist although policy exists,

implementation of structural and urban planning solutions that integrate housing replacement, land-use optimization, and risk reduction remains limited.

In the Pabahay 2000, Muzon South, City of San Jose Del Monte, informal settlements occupy land in hazard-prone zones and lack adequate structural safety and urban infrastructure integration. These conditions amplify vulnerability to flooding, land subsidence, and inadequate service delivery. The community's housing environment reflects the broader national issue but localized with its own spatial, structural and planning challenges. There is a clear need for housing interventions that do more than relocate informal settlers: such interventions must propose structurally sound housing units, urban planning integration for instances, land use, circulation, or public spaces, and risk mitigation, for instances flood resilience, or safe access. A few architectural design studies in the Philippines illustrate the feasibility of tenement-style housing to serve such needs. However, there remains limited research on combining structural design and urban planning to replace high-risk informal settlements in specific Philippine barangays with tenement-style models. This study addresses this gap by developing a structural and urban planning proposal for tenement-style housing to replace high-risk informal settlements in Pabahay 2000, Muzon South. The background thus leads directly into the investigation of how such a housing model may respond to local spatial, structural, and planning challenges.

Theoretical Framework


Sustainable Development Theory
World Commission on Environment and Development, 1987
Environmentally responsibility and long-term housing design
Maslow's Hierarchy of Needs
Abraham Maslow, 1943
Housing as a basic physiological and safety need
New Urbanization Theory
Duany, Plater, Z-yberk and Speck, 2000
Compatible, walkable, and organized community

This study's framework is built upon three foundational pillars that justify the urgent need and guide the comprehensive design for the Structural and Urban Planning Proposal for Tenement Style Housing in Pabahay 2000 Muzon South. First, Maslow's Hierarchy of Needs establishes the core ethical mandate, moving families from high-risk informal settlements directly addresses the fundamental necessity for physiological and safety needs, asserting that stable, secure housing is a prerequisite for human flourishing and development. Second, New Urbanization Theory provides the vital design blueprint, arguing that the new tenement structure must transcend simple shelter by integrating principles of walkability, social cohesion, and mixed-use spaces to foster a functional and connected community, thus mitigating the social isolation often associated with large-scale housing projects. The Sustainable Development Theory dictates the project's long-term responsibility, ensuring that the proposal is not a temporary fix but a lasting solution that is environmentally sound, socially equitable, and economically viable, guaranteeing a resilient and healthy community for future generations in the face of ongoing urbanization challenges.

Figure 1: *The theoretical framework illustrates theories from different studies.*

IPO Conceptual Framework

INPUT	PROCESS	EXPECTED OUTPUT
1. Demographic Profile of respondents in terms of: 1.1 Age 1.2 Number of households 1.3 Income Level 1.4 Length of residence 2. The benefits of Pabahay 2000 community in the design of tenement style housing that replace high risk informal settlement in terms of 2.1 Safety 2.2 Stability 2.3 Livability 3. Assessment on urban planning and housing standards in the design of tenement style housing in terms of:	1. Demographic Profile of Respondents • Conduct surveys and distribute questionnaires to gather data on age, number of households, income level, and length of residence. • Use statistical tools such as frequency distribution and percentage to analyze demographic information. • Summarize the community profile to understand population structure and living conditions. 2. Benefits of the Pabahay 2000 Community in the Design of Tenement-Style Housing • Gather residents' feedback through survey questions focusing on	1. A comprehensive Community Demographic Profile. It will provide a clear picture of the target population, detailing their average age, household size, income levels, and length of residence. This profile is essential for ensuring the final design meets their specific socio-economic needs. 2. A validated assessment of the design's key benefits. By processing the weighted mean from resident feedback, this will confirm how the tenement proposal successfully enhances safety, stability, and livability for the community. 3. An evaluation report on urban planning and housing standards. It will confirm that the proposed design's functionality and affordability are aligned with, or improve upon, existing local and national housing guidelines. 4. The final "Design Proposal for Tenement Housing".

3.1 Structural 3.2 Architectural 4. The effectivity of structural design of tenement style housing for the community of Pabahay 2000 in terms of: 3.1 Project Scheduling 3.2 Cost Estimate 3.3 Long term use	safety, stability, and livability. • Use weighted mean to determine the perceived benefits of the proposed housing design. • Compare responses to identify key factors that improve quality of life and housing satisfaction. 3. Assessment of Urban Planning and Housing Standards • Review existing local and national housing guidelines and compare them with the proposed tenement-style design. • Identify planning elements that align with housing principles. 4. Effectivity of the Structural Design of Tenement-Style Housing • Assess project scheduling, cost estimates, and potential long-term use through engineering and	This comprehensive proposal will be the possible result: • Feasible project scheduling. • A detailed cost estimate. • A clear plan for long-term use and sustainability. • The complete set of structural designs (plans, elevations, etc.) validated by your design software.

	architectural evaluation. • Analyze the efficiency of materials, layout, and construction timeline using quantitative assessment. • Interpret results to recommend a feasible and sustainable design suited for the Pabahay 2000 community.	

Table 1: *The conceptual framework represents the transformation of data into output*

Statement of the Problem

The Statement of the problem in this study is the absence of a viable structural and urban planning framework for tenement housing to replace at-risk residential areas in Pabahay 2000, Muzon South, City of San Jose del Monte, Bulacan. Even with government relocation and housing programs, informal settlers continue to occupy unsafe dwellings in the area, exposing them to structural risks, overcrowding, lack of basic services, and unsafe works. Existing housing interventions are often mismatched to the needs of communities, leading to resistance, underutilization, or deterioration of provided housing units.

To address this central problem, the study seeks to answer the following specific research questions:

1. How does the demographic profile of the respondents be measured in terms of:
   1.1 Age
   1.2 Number of households
   1.3 Income Level
   1.4 Length of residence

2. How can the design of tenement style housing replace high risk informal settlement in Pabahay 2000 benefited the community in terms of:
   2.1 Safety
   2.2 Stability

2.3 Livability

3. How does the urban planning and housing standards in the design of tenement style housing be assessed in the community of Pabahay 2000 in terms of:

   3.1 Structural

   3.2 Architectural

4. How does the effectivity design of tenement style housing for the community of Pabahay 2000 be assessed in terms of:

   4.1 Project Scheduling

   4.2 Cost Estimate

   4.3 Long-term use

Objectives of the Study

This study aims to develop a design proposal for tenement housing to replace at risk residential areas in Pabahay 2000, Muzon South, City of San Jose del Monte, Bulacan. Specifically, it seeks to:

1. To determine the demographic profile of the respondents in terms of:

   1.1 Age

   1.2 Number of households

   1.3 Income level

   1.4 Length of residence

2. To evaluate how the design of tenement-style housing can benefit the community of Pabahay 2000 in terms of:

2.1 Safety

2.2 Stability

2.3 Livability

3. To assess the urban planning and housing standards applied in the design of tenement-style housing in the Pabahay 2000 community in terms of:

3.1 Structural

3.2 Architectural

4. To evaluate the effectivity of the structural design of tenement-style housing for the Pabahay 2000 community in terms of:

4.1 Project scheduling

4.2 Cost estimate

4.3 Long-term use

Significance of the Study

This study is significant because it addresses a pressing social and structural problem: the persistence of high-risk informal settlements despite government relocation and housing programs. By proposing a tenement housing framework, the study contributes to both academic knowledge and practical planning solutions.

To the Residents of Pabahay 2000 Muzon South, the study provides a housing framework that prioritizes safety, stability, and community participation. It addresses their concerns on tenure security, access to livelihood, and resilience to disasters.

To the Local Government of San Jose del Monte and Policy-Makers (DHSUD, LGUs). Findings may serve as a reference in crafting localized housing and land-use policies. It can guide the design of future housing projects that are both structurally sound and socially acceptable, avoiding the shortcomings of past relocation programs.

To Urban Planners and Architects, the research introduces practical insights on how tenement housing can be adapted to Philippine conditions. It integrates structural engineering standards with urban planning strategies, offering a model that professionals can use in similar high-risk areas.

To Future Researchers, the framework can serve as a basis for further studies on housing policy, community resilience, and disaster risk reduction. It may also guide comparative studies between different housing typologies and their impacts on urban poor communities.

Scope of the Study

This study focuses on developing a design proposal for tenement housing to replace at risk residential area in pabahay 2000 Muzon South, San Jose del Monte, Bulacan. Employing a Descriptive-Developmental research design, the scope covers two primary dimensions, the socio-economic assessment and the technical design development. The socio-economic aspect involves gathering data on housing preferences, safety concerns, and affordability through a survey of 45 purposively selected household heads currently residing in hazard zones. The technical dimension encompasses the creation of a complete housing model, utilizing AutoCAD for architectural planning (site development and floor layouts) and STAAD.Pro for structural analysis to ensure compliance with the National Structural Code of the Philippines (NSCP 2015). The study is conducted within the Academic Year 2025–2026, culminating in the production of structural plans, urban design layouts, and cost estimates.

Limitations of the Study

The study is subject to specific limitations regarding geography, sample size, and output nature. Geographically, the research is strictly confined to the residential areas within Pabahay 2000, Muzon South, and does not represent other housing projects in San Jose del Monte. Due to the focused nature of the purposive sampling and the six-month research timeline, the respondents are restricted to 45 key informants, the findings reflect the specific needs of this group rather than the entire

population of informal settlers. This study is a design proposal and feasibility assessment; it does not involve the actual construction of the tenement housing. The financial aspects, specifically the Bill of Quantities (BOQ), are preliminary estimates based on current market prices and are subject to change during actual implementation phases, while the design process prioritizes critical structural and planning elements over exhaustive long-term environmental impact studies.

Definition of Terms

1. Descriptive-Developmental Research

This term refers to the research design utilized in this study, which is divided into two phases: first, a descriptive phase where data is gathered to assess the current housing conditions and needs of the community; and second, a developmental phase where those findings are directly applied to create the technical structural and urban planning proposal. This design ensures that the final engineering output is an evidence-based solution tailored to the specific context of the informal settlement.

2. Informal Settlement

For this study, this term denotes the existing residential clusters within Pabahay 2000, Muzon South, characterized by high-density, non-engineered structures. These areas often lack basic services, proper compliance with building codes, and are situated in zones exposed to environmental hazards such as flooding or landslides, thereby necessitating a formal relocation and redesign plan.

3. Purposive Sampling

This is the non-probability sampling method used to select the study's participants. It refers specifically to the selection of 45 household heads or key decision-makers who live within the identified at-risk zones. They are chosen because they possess the most relevant firsthand experience regarding the community's safety

risks, affordability constraints, and specific housing needs, making them the most qualified informants for the design assessment.

4. **STAAD.Pro (Structural Analysis and Design Program)**

This is the commercial computer software used as a technical tool in the developmental phase of the research. Its primary function is to model the proposed tenement housing in three dimensions and perform finite element analysis. It is essential for verifying the structural integrity and resilience of the building's components (beams, columns, slabs) by simulating their response to various design loads, including gravity, wind, and seismic forces, as governed by NSCP 2015.

5. Structural Safety

In the context of this engineering study, structural safety is the core design objective and refers to the degree to which the proposed building can withstand all expected forces and environmental hazards without failure or excessive deformation. The achievement of structural safety is quantitatively demonstrated by ensuring that the final tenement design adheres strictly to the material, strength, and design specifications mandated by the National Structural Code of the Philippines (NSCP 2015).

6. Tenement Housing

This is the specific architectural output of the developmental phase. It refers to the proposed multi-story, high-density residential structure designed to maximize

land-use efficiency in the urban context of Pabahay 2000. The design provides standardized, safe, and durable dwelling units intended to replace the existing informal, high-risk structures and offer long-term secure tenure to the displaced families.

CHAPTER 2

Review of Related Literature and Studies

This chapter presents a comprehensive review of literature and studies related to the current research problem followed by synthesis that proves the necessity of the current research by clearly articulating the gap in knowledge that the study aims to fill.

Foreign Literature

According to Juan Du l. (2022) Controlling climate change is the same as controlling cities and their urbanization. In order to bear the burden of climate change adaptation, upgrading of informal settlements in the global south has equated to being responsive with the development of its city and region in general. Shifting the on-site upgrading paradigm to city-led and community-driven with national funding opens up opportunities for community resilience development, particularly in nations aiming for inclusive development. This study explores informal settlement development dynamics and its resilience positioning in tandem with the metropolitan development in three Southeast Asian nations. Greater Manila Area, Bangkok Metropolitan Region and Hanoi Capital Region are the context for this study. The study primarily responds to informal settlement upgrading roles, mechanism and strategies for building resilience in the three metropolises, while also revealing their city-regional development requirements. The methodology of this research is extremely participatory, showing a blend of multi-spectrum stakeholder workshops, online

questionnaires (because of COVID), expert interviews, project intermediate reports and communication with the local expert team in the three nations, etc. The essay tries to offer cross-country evaluation of the core strategies of informal settlement upgrading, corresponding institutional constellations and upgrading uses as well as the three metropolises' urban development. This try emphasizes the urgent demands of reducing multi-facet vulnerability of informal communities, the most victimized people of climate change and uncontrolled urbanization. In addition, this study will also demonstrate the mindset shift of how decision-makers and the public consider upgrading goals, e.g., reconfiguring secure tenure tools.

According to Marnane & Greenop (2023) Informal settlement is a spatial expression of inequality, in the sense that individual's resort to informal solutions as housing where formal ones are not accessible, typically due to lack of funds but also due to other reasons like social exclusion. Yet little has been learned about the urban and architectural forms that make up informal settlements, and therefore how this inequality materializes spatially, and what in particular is lacking in these settlements is not yet well understood. We employ the United Nations Right to Adequate Housing framework as a standard of measurement to conclude whether or not housing is perpetuating inequality through one or more inadequacies, and if so, we classify these as being inequitable housing. We study the built forms of four cases in three informal settlements in Ahmedabad, Gujarat state, India, to understand how these urban forms represent and/or address multi-scalar urban housing inequalities. Four physical spaces are found to be significant: the location of the dwelling site, control by the resident

over the design and construction of the dwelling, the threshold design of the dwelling, and the nature of common open spaces. In a suitable mix, the quality of such physical space in informal settlements can help informal settlement inhabitants attain housing adequacy. Improved understanding of the built environment of informal settlements can assist designers and planners to tap the potential of informal settlement environments as an asset of urban poor, establish a context that prevents informal settlements from becoming 'slum-like' and contribute to building trajectories towards urban equality.

According to Visagie, J. & Turok, I. (2020) The disadvantages of densely populated informal settlements are a direct contradiction to the potential offered theoretically that urban density holds the secret to constructing more productive, sustainable and resilient cities. African cities should not be expected to thrive if most people inhabit sprawling informal settlements with no hope of a better future than the extension of basic services. There is a good argument for governments adopting a wider reconstruction agenda to capture the potential of density for all-around development. The central argument of the paper is that urban population expansion would be accommodated more efficiently by building up rather than just expanding out. We look at the situations where this holds and how the state and communities can remodel conditions in informal settlements with their limited resources. Expanding upwards demands participatory planning, greater tenure security, settlement redesign, and in-situ investment in public services and housing.

According to Hussainzad & Gou (2024) This research examined the climatic risks and exposures of informal settlements in the Global South and the degree to which they affect the exposures. Applying the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2009 approach and deductive content analysis, the present research critically analyzed 69 documents, consisting of 28 peer-reviewed journal papers sourced from Scopus and ScienceDirect and 41 online releases found using the Google search engine and snowballing method. Document selection criteria concerned relevance to climate risks and vulnerabilities, with removal of non-peer-reviewed, non-English, and unreliable sources, as well as irrelevant studies. Seven critical climate hazards affecting informal settlements were found to be: floods (44), temperature change (41), storms (31), sea level rise (30), drought (28), rainfall (23), and landslides (14). The key vulnerabilities noted were poor living conditions (64), health hazards (50), absence of basic facilities (49), poor sanitation (41), poor hygiene (39), and restricted access to water (38). The intersection of climate risks and vulnerabilities poses significant direct, indirect, and low-level threats to informal settlements. As vulnerable as Asia, Africa, and Latin America are, most literature has concentrated on formal and developed regions. The conclusions emphasize the extreme importance of climate adaptation initiatives in Global South informal settlements in an effort to meet the United Nations Sustainable Development Goals (SDGs).

According to Tavares & Bonnin (2024) 1 billion inhabitants of informal settlements live with limited urban services, poor housing conditions, insecure land tenure, and increased exposure to climate-related risks. Lacking significant government assistance, these settlements take on the responsibility of coping with climate risks. This systematic review used Scopus and Web of Science databases to search for and synthesize peer-reviewed articles that examined global climate-related hazards within informal settlements in the last 23 years. Search terms were “Informal Settlements OR Slums” AND “Landslide” OR “Heat Stress” OR “Heatwaves” OR “Urban Heat Island” OR “Flooding” OR “Water Scarcity”. Trends in published articles on climate-related hazards in informal settlements increase in the last six years, according to the review were identified, the bulk about 70% deal with flood risk effects and adaptation. We have identified six emerging trends, viz. 1) gender analysis, 2) scaling demographies, 3) adaption actions, 4) transferability, 5) GIS and remote sensing, and 6) building climate resilience. Although high temperatures are common in areas where informal settlements occur, research on heat-related hazards, such as heat stress or Urban Heat Island, is weak. Individuals or households mainly undertake risk reduction and adaptation activities, with few catalytic, multi-stakeholder initiatives being noted. Establishing a transferable, community-focused climate risk assessment model would substantially strengthen resilience and adaptive capacity to climate hazards and disaster risks in informal settlements, with the need for collaborative, multi-scale approaches.

Local Literature

According to Ner (2023) Measurement of resilience is a new trend in disaster risk reduction. Its application, however, in the cities of the Global South has been challenging because of the specificity of southern urbanisms and data issues. Therefore, the Resilience Benchmarking Assessment and Impact Toolkit (RABIT) framework was developed recently to facilitate resilience assessment in informal, vulnerable, and disaster-risk contexts of southern cities. This article claims the applicability of the RABIT model and applies it to evaluate the resilience of Manggahan homes, a relocated disadvantaged community in Pasig City, Metro Manila. Withdrawing from a quantitative method and employing exploratory factor analysis (EFA), the research indicated that scale, strength, and learning properties of the RABIT model are significant contributors to the resilience of the community. Self-organization, diversity, and redundancy have equivalent contribution levels. Equality and speed were discovered to be the weakest relative contribution. The research findings stress that one should take a holistic view of resilience in resettled communities and have an integrated and integrated approach with an eye on multiple aspects of daily life in order to proactively develop adaptive and future capacitive resilient abilities.

According to Cuesta & Cahandig (2025) The study analyzes the spread of Informal Settler Families (ISFs) in Davao City space and its impact on the development of sustainable human settlement. The study integrates quantifiable data from official government records with qualitative information from policy papers to

identify ISF concentrations in the 11 administrative districts. The highest ISF populations are found in Districts 1 and 2 especially in Talomo, Poblacion, Bunawan and Agdao barangays which show intensive urban pressure and lack of housing and environmental risk exposure. The countryside barangays of Paquibato, Marilog and Baguio show negligible ISF presence due to their low accessibility and low land demand and economic activity. The study shows that approved Local Shelter Plan (LSP) is an urgent need to implement socialized housing schemes and resettlement strategies and participatory urban development plans. The findings of the research provide policymakers evidence-based recommendations for developing tailor-made housing solutions which are based on spatial equity and sustainable urban development.

According to Besana & Sanchez (2020) Relocation of informal settlers is one of the prime issues of a developing city and this is where tenement housing, a low-rise apartment building, comes in to address the issue. This study is intended to design a five-storey tenement housing for relocation of informal settlers who resides in slums of Davao city specifically at Brgy. 5-A, Purok 7. The salient feature of the design is that it will be using limited land space which will suit many residents more than some other relocation site methods which would need a larger land area. It would also serve as an eco-friendly green building which can make use of natural resources like sun light, air, and rain water. All calculation and design in this study are checked properly, and comply with all specifications of National Structural Code of the Philippines (NSCP 2015), National Building Code of the Philippines (NBCP), and with

consultation from the Philippine Green Building Code, This relocation location saves the residents from the issues of contaminated waters around the areas, poor quality of life, and unavailability of the residents to a good sanitary system. This would also help Davao City avoid wasting land spaces for relocation areas and could use these more for development.

According to Morada (2021) The research aimed at the design of Four (4) Storey Tenement Building which was situated in Binangonan Rizal. The building houses flats or apartments shared by several. The primary aim of the project is to meets the demands of the people of the community for the fast-growing population. In this Project we care about the plan, analysis, and design of Four (4) storey tenement building. The design of the tenement building is prepared using AUTO CADD software. The structures were analyzed by using STAAD PRO. Along with NSCP 2015 code of practice for plain and reinforced concrete. RCC slab, beam, column, footing, and staircase is designed by the working stress method according to NSCP 2015 code.

According to Dovey & Recio (2023) On-site upgrading is increasingly accepted as the sole sustainable approach to redevelopment of substandard informal settlements displacement harms livelihoods of the urban poor and removes the city's workforce. We also understand that redevelopment hardly ends informal housing production, instead starts a process of 're-informalization' that has the potential to result in over-development. This article is a socio-spatial analysis of such processes within a settlement in Metro Manila called Sitio Pajo. An upgrading process was

initiated in 2007 involving a community organization, NGOs and the state. Demolition of existing structures, imposition of a formal street/lane system, and redevelopment with both formal housing and a site-and-services scheme were components of the project. This critical analysis is concerned with public space and urban form, specifically the way the new urban layout constitutes a re-start for a second round of informalization. The outcome has been an overall successful re-making of public space, streetlife, accessibility and building longevity, though there are considerable disparities between formal housing and the site-and-services area. The challenge which still exists is one of making this re-informalization not lead to over-development.

Foreign Studies

According to Mosteanu (2021), The study of the materiality of practices, such as kitchens, furniture and clotheslines, this article adds to a knowledge of ethics of dwelling that recognizes humans' and nonhumans' entanglements within homes they share together. It draws on a case study examination of tenement houses a typical form of unregulated, private rented accommodation in Buenos Aires and New York City at the turn of the nineteenth century. The paper borrows from this kind of housing to suggest an account of ethics that rethinks the focus on rule-governed behaviour and judgemental action, influential in the study of ethics and morality throughout the disciplines. It demonstrates that ethical practice is locally embedded, adaptive, and based on improvisation rather than individual interest, universal reason or conformity to norms. Ethical practice is place-based or emplaced, but never place-bound. Home

is reconceived as a material and affective space negotiated in practice and linked to other places and temporal horizons.

According to Zigler et al. (2023), The preservation of structural details, materials, and technologies, as well as the prolongation of the life of these historic structures, are among the most significant demands now imposed on the construction industry. The preservation of the large number of tenement buildings from the second half of the 19th and early 20th centuries in European cities, where many other architectural details and elements have been maintained, is noteworthy in this context. These structures have a reasonably high structural quality. In order to preserve the architectural and historical significance of urban buildings, achieve acceptable compliance with the requirements and provisions of the currently applicable regulations and standards, and demonstrate cost-effectiveness, this paper will analyze the situation and define the requirements for renovation.

According to Wysznacki (2025), The study is dedicated to the issue of reusing the historical industrial buildings for new purposes. The key problems of such actions and the conditions required for them to be possible are revealed. The available experience of conservation of industrial buildings with a function change is examined, and how it can be applied in the post-war reconstruction of Ukraine. The principal requirements are a location in the city centre with a good transport approachability and residential environment in close proximity. There are examples of how new public centres of attraction with a function of an art origin when appearing on the territory of industrial territories occur with the preservation of historic buildings of industrial type.

According to Moiseeva (2023), This study makes one of the forms of housing known, making it very cheap. Remarkably, the most significant drawback of employing rental housing is the absence of formation of its market. Tenement houses possess a certain historical tradition in pre-revolutionary Russia and in foreign countries. Essentially, these were multi-story multi-room buildings of the corridor type. This article is particularly focused on a new phase in the construction of tenement houses, and on an entirely unforeseen ground: the city population flock to nature and lease low-rise accommodation in rural and suburban areas for leisure. These individuals are looking to create their own household territory, not leaving behind city apartments. The most priceless is the rehabilitation of historic heritage landmarks for rental. By the planning pattern, low-rise rental homes are constructed as two-or three-story separate houses, with a service block, and with a higher number of floors (up to four), with a corridor or gallery system and positioning of service premises on the ground or top floor. We reach the conclusion that rental house diversity will provide a response to changing the population's demographic structure and demand, to preserve the workforce mobility, and to meet the demand of young families.

According to Abubakar et al (2021), Tenement housing in the majority of places across the nation has been a ground for crime and violence breeding, with the result that violence has escalated contributing to the already high rate of insecurity in Nigeria. Conflicts are inherent in the human interaction and it's usual among occupier of land and building which share common to many individuals. They take place between the occupants of tenement houses in Minna. This research discusses quality

and social relationship effect among residents of tenement houses in Minna, Niger State with a view to proposing means of achieving peaceful enjoyment and enhancing co-tenant relationship. The research employed cross- sectional survey, questionnaire was distributed to selected to tenements houses in Minna. The questionnaire response was subjected to descriptive statistic, frequency distribution table with percentage and liken scale was employed. This result indicates that the overall tenant's satisfaction index (TSI) with the building characteristic is 3.56 (satisfied). Tenants' overall satisfaction index of the quality of the building was 3.45(fairly satisfied) and overall Tenants Satisfaction Index(TSI) the neighborhood characteristic was that tenants in the study area were fairly satisfied(3.21).It also found that the most frequent causes of conflicts between residents of the face-me-I-face-you type of tenement residential houses in Minna is poor infrastructure. It thus suggests that there should be proper policy development to lead and ensure the provision of sustainable rental housing as a substitute for homeownership in the research area and Nigeria in general.

Local Studies

According to De Guzma (2022), Urbanization of Manila is the top contributor of rural to urban migration inflows. This type of urbanization has contributed to an increase in the population, creating arising need for housing. This need resulted in an increase in informal settlements, therefore, prompting the government to come up with low-cost housing. To solve this issue, the existing government housing developments have clearedinformal settlements and constructed low-cost housing vertically to offeradditional housing units for individuals while conserving space because of its

compact footprint. Nevertheless, this solution resulted in building an environment unsuitable for thecommunities' usual daily daily lifestyle. Furthermore, it does not tackle design elements that build up healthy and active urban neighborhoods. This dissertation would like to offer a large-scale housing design proposal to informal settlers, with guidelines and solutions for enhancing their urban living environment. The objective is to generate alternative design strategies and typologies based on incremental housing principles to satisfy social, cultural, and economic requirements.

According to Estacio et al. (2021), In the 18th and 19th centuries, while Manila already had its commercial areas, the character of the city was still residential. Nevertheless, in spite of the colonial governments' grandiose schemes, Metro Manila evolved far from the originally conceived. By the 1940s, Manila and the rest of the nation were filled with grand civic buildings and posh houses. The bahay-na-bato was structured into mansions, and the bahay-kubo into the tsalet. Most of these buildings at the close of the World War II were bombed. Multistorey tenements formed part of the alternative measures to accommodate the housing demands of a growing population. Sampaloc is part of the city districts making up Manila, Philippines. It is referred to as Metropolitan Manila's" University Belt", following the concentrations of high-level educational institutions within it. Dapitan Street is one of the leading streets in Sampaloc, Manila. This study will ascertain the Dapitan Street prevailing housing condition, its commercial growth and the developmental effect. This study will provide recommendations according to the study findings.

According to Dimalanta et al. (2024), This study analyzes the experience of KADAMAY in Sitio San Roque, a city poor neighborhood in Quezon City, as it faces the challenge of the state's constant and continued attempts at slum clearing promoted by neoliberal urban development policies. Using data collected through years of community participation, such as field notes and transcribed interviews from focus group interviews with chosen community leaders and KADAMAY members, authors describe the harmful effects of state practices marked by forced evictions and neoliberal housing policies on the community. To these challenges, the article maps the evolution of KADAMAY San Roque's strategies of resistance. Using the repertoires of contention and arenas of interaction frameworks, it identifies a range of new practices like Street Occupation, Tumbalik, Temporary Shelter, and the Community Development Plan as significant expressions of resistance to abusive state practices and policies. These tactics developed following the success of the community in mobilizing barricades against forced eviction. This article sets the context wherein these resistance strategies emerge and what it means for the state. Last, it provides recommendations based on the lessons learned from KADAMAY San Roque's struggles to help enrich the literature on urban housing social movements.

According to Ballesteros et al. (2024), The Philippine government has institutionalized and promoted the provision of basic services in resettlement areas through several flagship housing programs and the formulation of policies, guidelines, and/or standards. Literature presents, however, that the majority of resettlement areas are not provided with the basic services and the social and economic opportunities to

ensure the growth of sustainable and livable communities. The research observes that resettlement schemes need to be well-planned both in the process and the physical layout. Laws and policies of the government must be converted into explicit minimum standards that are implemented at the subnational and national level. To develop these standards, the authors consulted current local and global policies and guidelines for resettlement housing and studied the good practices in chosen resettlement schemes and among implementing projects. The policy mapping and case study resulted in the development of policy and implementation gaps that were utilized in the preparation and improvement of the resettlement planning assessment tool.

According to Soriano (2021), Informal urbanization is a major factor in Metro Manila, Philippines, one of the densest and fastest-growing metropolitan areas in the world. The city-region is being shaped by the dynamic yet uncoordinated force of informal urbanization, which is at odds with the official planning instruments' depiction of a contemporary, globally competitive city-region. The problem of informal settlements in the city has not been sufficiently addressed by housing procedures and urban planning, despite numerous attempts. To achieve sustainable and equitable urban development, I look into how Metro Manila's housing governance procedures and formal planning policies might better interact with urban informality.

Synthesis of Related Literature and Studies

The collective foreign literature reveals that informal dwellings is often built with weak foundations low quality materials and unsafe layouts facing combined risks of disasters limited access to utilities poor sanitation that underscore the urgent need for safer and better build housing interventions. Foreign studies on tenement housing highlight its historical and cultural importance as well as its adaptability to preservation and renovation while exposing challenges like weak housing markets social conflicts and moderate tenant satisfaction it highlights the needs for balanced housing strategies that modernized the communities.

Local Literature reveals that informal dwellings in the Philippines are commonly built in improvised materials and unsafe construction practices that makes them structurally weak and prone to collapsing while poor urban planning is characterized by disorganized layouts hazard prone locations that makes their community vulnerable and risks. Finally, local studies shows that metro manila have rapid urbanization and population growth that intensified informal settlements while government answer such as low-cost housing, resettlement programs and eviction policy but often fail to gather cultural and economic needs that leads to an issue of unsustainability and lack of services.

CHAPTER 3

Research Methodology

This chapter outlines the systematic research technique utilized to construct the design plan for tenement housing for Pabahay 2000, Muzon South. It outlines the Descriptive-Developmental design of the study, which includes a descriptive phase that uses a systematic survey of 45 carefully chosen household heads to find out what the community wants and needs in terms of housing, and a developmental phase that focuses on coming up with solutions.

Research Design

This study employs a Descriptive-Developmental Research Design is directly aligned with the goal of creating a design proposal to replace the at-risk residential areas in Pabahay 2000. This method connects the assessment of existing hazards with the design of a structural solution of two phase:

The Descriptive Phase, the researchers will collect information to find out what precise structural weaknesses, environmental dangers, and demographic traits the people who live in Pabahay 2000's hazard zones have. The study employs a structured survey administered to 45 selected family heads to delineate the prevailing hazardous circumstances requiring replacement, so assuring that the ensuing design effectively

mitigates the genuine dangers (e.g., flooding, unsafe materials) encountered by the community.

The Developmental Phase is the technological development of the new structure, based on the information received about what the community requires. The researchers will use AutoCAD to plan the building's architecture and STAAD.Pro to analyze its structure to make a model of a tenement with multiple floors. This step turns the safety gaps that were found into a real engineering solution. It makes sure that the suggested design precisely follows the National Structural Code of the Philippines (NSCP 2015) a safe, long-term replacement for the informal settlement.

Sample and Population

The population of this study consists of residents currently living in at-risk residential area within Pabahay 2000, Muzon South, City of San Jose del Monte, Bulacan. Based on records from the local government and barangay housing office, the area is characterized by high-density, and non-engineered structures.

From this population, a sample size of 45 respondents was selected using a purposive sampling technique. This method is appropriate given the specific inclusion criteria: respondents must be household heads or decision-makers living within the identified hazard zones. While limited in number, these 45 key informants possess the firsthand experience necessary to define the safety and functional requirements of the proposed tenement design. The sample size is deemed sufficient for a descriptive

needs assessment in a design-focused study, allowing for manageable yet in-depth data collection within the six-month research duration**.**

Research Instrument

The primary instrument used in this study is a structured survey questionnaire, designed to gather quantitative data from residents of at-risk residential area in Pabahay 2000, Muzon South, City of San Jose del Monte, Bulacan. The instrument aims to measure the respondents' perceptions and experiences related to housing safety, environmental risks, and livability, which directly support the development of the proposed tenement housing design.

The questionnaire is divided into four parts. The first part gathers the demographic profile of respondents, including age, sex, family size, household income, and length of stay in the community, to understand their socio-economic background. The second part focuses on ensuring residential safety and hazard prevention by assessing perceptions of community safety, sanitation, road access, and environmental risks. The third part evaluates structural durability and environmental stability, emphasizing the use of resilient materials, disaster-prepared design, and efficient land use through multi-story housing. The fourth part explores sustainable livability, examining how housing design, accessibility to public facilities, and community relationships contribute to improving residents' quality of life and willingness to relocate to safer tenement-style housing.

A five-point Likert Scale was used to quantify responses, where: 5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, and 1 = Strongly Disagree. This scale allows respondents to express the degree of agreement or disagreement with each statement, providing measurable data for statistical analysis. The use of a Likert Scale follows the method described by Joshi et al. (2015), which is effective for assessing perceptions and attitudes in housing and urban studies. The validated questionnaire was then pilot tested among ten respondents from a nearby settlement area to confirm reliability prior to its full administration.

Data Gathering

Data collection for this study followed a structured and ethically guided process. Before data gathering, a formal request letter was submitted to the Barangay Office of Muzon South and the City Housing and Urban Development Office of San Jose del Monte, Bulacan, seeking permission to conduct the study among residents of Pabahay 2000. Upon approval, coordination was made with local community leaders to identify qualified respondents from high-risk informal settlements.

The data were collected through a face-to-face survey using a validated structured questionnaire, which was also made available in Google Form for respondents who preferred an online option. Each respondent was informed about the study's purpose and provided with a consent form ensuring voluntary participation. Respondents were assured of confidentiality and informed that their responses would

be used solely for academic purposes. The survey was conducted over a two-week period, allowing sufficient time for distribution and retrieval of responses.

During this period, the researchers personally visited households to administer the questionnaires and assist respondents who required clarification. For online submissions, reminders were sent to ensure complete participation within the given timeframe. After data collection, all responses were checked for completeness and consistency. The gathered data were then encoded and organized for statistical analysis. Throughout the process, ethical standards were strictly observed, maintaining respondent anonymity and respect for privacy to ensure the reliability and integrity of the study's findings.

Project Design Development

Following the data gathering and statistical analysis of the community's preferences and needs, the study will proceed with the technical development of the tenement-style housing proposal. This phase is divided into three stages: Architectural Planning, Structural Analysis, and Project Estimation.

A. Architectural Planning and Modeling

The architectural design will be formulated based on the spatial needs identified in the demographic profile and the safety preferences gathered from the survey. Using AutoCAD, the researchers will generate the site development plan, floor plans, elevations, and cross-sections. The design will adhere to the minimum requirements of the National Building Code of the Philippines (PD 1096) and Batas

Pambansa Blg. 220 (Socialized Housing Laws) to ensure the proposal is compliant with legal standards for spacing, ventilation, and accessibility.

B. Structural Analysis and Design

Once the architectural layout is finalized, the structural framework will be modeled using STAAD.Pro. This software will be used to perform finite element analysis to test the building's integrity against critical load combinations.

Load Assumptions

The structure will be subjected to Dead Loads (self-weight and materials), Live Loads (occupancy), and Environmental Loads (Wind and Seismic) in accordance with the National Structural Code of the Philippines (NSCP 2015).

Safety Verification

The analysis will verify if the structural members (beams, columns, and slabs) can withstand the expected stresses and deformations without failure.

C. Cost Estimation and Scheduling

To assess the project's feasibility, a Bill of Quantities (BOQ) will be prepared using Microsoft Excel. This will quantify the materials required for construction to generate a preliminary cost estimate. Additionally, a construction schedule will be projected to demonstrate the timeline for the proposed development, addressing the study's objective regarding project scheduling and long-term use.

Statistical Tool

To analyze the data gathered from respondents, the study employed descriptive and inferential statistical tools appropriate for a Descriptive-Developmental research design. These tools were used to interpret the results objectively, quantifying the community's housing needs and preferences to serve as the basis for the structural and urban planning proposal.

A. Percentage

The Percentage formula was used to describe the demographic profile of the respondents, such as age, family size, income level, and length of residence. This tool provided a clear overview of the population structure, ensuring that the proposed design aligns with the socio-economic capacity of the target beneficiaries.

Formula for Percentage:

$$\boldsymbol{P = \left(\frac{f}{N}\right) \times 100}$$

Where:

P = Percentage

f = Frequency of responses

N = Total number of respondents

B. The Weighted Mean (W.M.)

The Weighted Mean was utilized to interpret the respondents' perceptions regarding structural safety, environmental hazards, and housing preferences. This tool determined the average rating for each survey item based on the five-point Likert Scale, allowing the researchers to quantify the level of agreement on key design considerations.

Formula for Weighted Mean:

$$\text{Weighted Mean} = \frac{\sum(\boldsymbol{f} \times \boldsymbol{X})}{\boldsymbol{N}}$$

Where:

Weighted Mean

f = Frequency of each response

X = Assigned weight of each response

N = Total number of respondents

C. Ranking

To identify design priorities, Ranking was employed. This method arranged the weighted mean results from highest to lowest, highlighting the most critical issues (e.g., safety, sanitation, or open spaces) that require immediate attention in the proposed tenement housing model.

The combination of these descriptive tools ensures an accurate and meaningful interpretation of the gathered data, forming a strong evidence-based foundation for the Project Design Development phase.

Research Schedule

To ensure the timely completion of the study and the effective implementation of the design proposal, the researchers have structured the activities over a six-month period. The project timeline is strictly divided into three phases to maximize efficiency:

A. Pre-Implementation and Data Gathering (Months 1–2)

This phase prioritizes the approval of the research proposal and coordination with the Barangay officials of Muzon South. Key activities include the rapid validation of the survey instrument and the administration of surveys to the 45 respondents. Data encoding will be done concurrently with collection to expedite the process.

B. Design Development and Simulation (Months 3–4)

Immediately following data analysis, the technical design process will commence.

Month 3

Architectural planning using AutoCAD, translating survey preferences into site development plans and floor layouts.

Month 4

Structural modeling using STAAD.Pro. This includes applying NSCP 2015 load standards and verifying safety factors

C. Finalization and Defense (Months 5–6)

The final months are dedicated to the completion of the study.

Month 5

Preparation of the Bill of Quantities (BOQ) and Project Schedule using Microsoft Excel and writing the final chapters.

Month 6

Final manuscript revisions, preparation of presentation materials, and the Final Oral Defense.

QUESTIONNAIRE

Title of the Study: **A DESIGN PROPOSAL FOR TENEMENT HOUSING TO REPLACE AT RISK RESIDENTIAL AREA IN PABAHAY 2000 MUZON SOUTH, SAN JOSE DEL MONTE BULACAN**

This questionnaire aims to collect data on the existing housing conditions, environmental risks, and community perceptions that will guide the formulation of a proposed tenement-style housing plan. The gathered data will be used solely for academic purposes and will remain strictly confidential.

Part 1. Demographic Profile of Respondents (Please check or write the appropriate answer.)

1. Age: ___ years old

2. Sex: □ Male □ Female

3. Family Size: ___ members

4. Monthly Household Income:

□ Below ₱10,000 □ ₱10,001–₱20,000 □ ₱20,001–₱30,000 □ Above ₱30,000

5. Length of Stay in the Community:

□ Less than 1 year □ 1–3 years □ 4–6 years □ More than 6 years

Part II. Ensuring Residential Safety and Hazard

Scale:
5 – Strongly Agree 4 – Agree 3 – Neutral 2 – Disagree 1 – Strongly Disagree

Safety	5	4	3	2	1
1.The proposed tenement housing should promote safety, comfort, and sustainability.					
2. The spacing between houses allows safe access and ventilation.					
3. Drainage and sanitation systems in the community are functional.					
4. The location of the community exposes residents to environmental hazards (e.g., flooding, landslides).					
5. The area's road network provides safe and easy access for emergency vehicles.					

Part III. Structural Durability and Environmental Resilience in Housing

Stability	5	4	3	2	1
1. Multi-story housing will improve land-use efficiency in the area.					

Housing design should include disaster-resilient features.					
3. Proper waste disposal and drainage systems must be part of the housing plan.					
4. The proposed design will reduce exposure to environmental risks					
5. The current housing structures in this area are made of durable materials.					

Part IV. Enhancing Quality of Life through Sustainable Housing Design

Livability	5	4	3	2	1
1. A tenement-style housing model is a suitable replacement for high-risk settlements.					
2. There is sufficient open space or communal area for residents.					
3. Accessibility to public facilities (schools, transport, markets) affects housing livability.					
4. The housing model can strengthen community relationships and safety.					
5. I am willing to relocate to a safer, better-designed tenement-style housing community.					